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EXAM INSTRUCTIONS

D0Q42A Corporate Finance

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Instructions for students (read this first)

- Please write your **identification** info (i.e., student name and number) on every page
- **Maximum duration**: 180 minutes (from the official starting hour of the exam)
- Exam type: written, closed book
- Only the following auxiliary materials are allowed:
  - **Pen**
  - **Non-programmable calculator**
- Students are allowed to use their own pen, but should only use the paper provided by the university. **The last 4 pages** of this booklet are left for derivations/calculations. **Other papers and notebooks are not allowed.**
- Mobile phones and smartwatches, or other electronic devices should be handed to the invigilators who will keep them for you until the end of the exam. All material such as jackets, backpacks, books and own paper should be left at the back or the front of examination room.
- For any irregularity of a student, all articles in the irregularities-section of the exam regulations apply.
- Please, check that your exam bundle contains **12 questions**. Immediately ask the surveyor for another bundle if this is not the case. Please, do not detach any page from this bundle.
- **Only the answers written in the exam answer sheet (see next page) will be checked.** Write you answers in the exam answer sheet neatly. If I cannot read what you wrote then I cannot evaluate it, which will result in zero points awarded.
- The **maximum** number of points attainable is **120**. There are **12 questions**. Each question, if correctly answered, gives you **10 points**. Each question has **4 possible answers** with only **one** of them correct.

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Answer Sheet with solution

Your exam will be graded based on the answers provided in this answer sheet. Make sure you leave time to transfer your answers into the table below. Answers should be reported as a), b), c) or d). Only one answer can be reported per question. Make sure you write neatly in this table.

State your name and surname very clearly right here below:

Exam variant: A

	Answer:
Exercise 1	**c)**
Exercise 2	**b)**
Exercise 3	**b)**
Exercise 4	**d)**
Exercise 5	**c)**
Exercise 6	**d)**
Exercise 7	**c)**
Exercise 8	**a)**
Exercise 9	**a)**
Exercise 10	**c)**
Exercise 11	**d)**
Exercise 12	**a)**

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List of Formulas:

Present value of annuity: $\mathrm{PV} = C\frac{1}{r}(1 - \frac{1}{(1+r)^n})$

Future value of annuity: $\mathrm{FV} = C\frac{1}{r}((1+r)^n - 1)$

Present value of perpetuity: $\mathrm{PV} = \frac{C}{r}$

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Easy questions

1. First question is about types of firms and corporations in particular. Select the correct statement below:

   a) ☐ Corporation is the most common type of firm in advanced economies

   b) ☐ Limited Liability Companies account for the bulk of total revenues in advanced economies

   c) ☒ Corporation's income is effectively taxed twice

   d) ☐ Corporations are not subject to limited liabilities

   (you can easily verify that only c) is true if you check the slides for Lecture 1)

2. Firm X has $29 in productive capital (machines and equipment), $25 in cash, $15 in outstanding long-term debt, $10 in outstanding short-term debt, $6 on account receivable, and $3 on account payable. All figures are book values. What is the book value of Firm X's equity? Select the correct answer:

   a) ☐ 29

   b) ☒ 32

   c) ☐ 25

   d) ☐ 18

   (This is a very easy one. All you need to know is some basic accounting from the slides for Lecture 2)

3. Suppose that the discount rate is given by 1.8% at annual frequency. What is the present value of $1107 paid in 2 years from now (rounded to 1 decimal place)? Select the correct answer:

   a) ☐ 1067.4

   b) ☒ 1068.2

   c) ☐ 1069.1

   d) ☐ 1068.8

(very simple question based on Lecture 3. Just compute 1107/(1.018)^2)

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4. What should be the price of a 4 year zero-coupon bond with a face value of $100 and with maturity date in 2 years from now (rounded to 1 decimal place)? Assume that the relevant interest rate is 2%. Select the correct answer:

   a) ☐ 94.2

   b) ☐ 92.3

   c) ☐ 98.0

   d) ☒ 96.1

   (This one is based on Lecture 6. The only "catch" here is that the maturity date in 2 years—that is, you should not care that this was a 4 year bond. 100/1.02^2)

5. You want to estimate the Firm MMM's market value of equity. You have collected some basic financial data on Firm MMM. In particular, Firm MMM's sales are $10, book equity $10, and dividends $0.5. Furthermore, you have collected data on comparable firms C1, C2, and C3, in terms of some financial ratios summarized in the table below:

	C1	C2	C3
Market/Sales	1.3	1.1	1.2
Market/Book	1.15	1.05	1.1
Dividend/Market	0.04	0.05	0.06

   (note, "Market" stands for market value of equity)

   Use the data in the table above to estimate the Firm MMM's market value of equity. Select the correct answer:

   a) ☐ 9

   b) ☐ 10

   c) ☒ 11

   d) ☐ 12

   (This one is based on Lecture 7 and one of the voluntary home assignment (practices exercise) So, I won't explain how to solve it just check the solution to the relevant practice exercise.)

6. In our last lecture, we examined the extended trade-off theory of capital structure—that is, the trade-off theory with taxes, financial distress, and agency costs. What does this theory imply with regard to the effect of agency costs on firm leverage?

   a) ☐ agency costs decreases leverage

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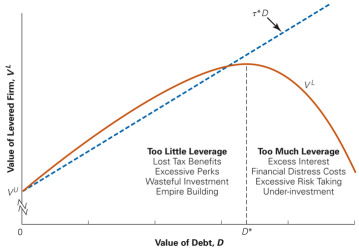
b) ☐ agency costs have no effect on leverage

c) ☐ agency costs increases leverage

d) ☒ agency costs have an ambiguous effect on leverage

(This one, to my surprise, turned out to be the hardest exercise. Only a few of you, and I mean 3-4 out of 163, got this one correct. At least one of you also gave a very nice reasoning behind it, so at least in this case I am certain this was not just a guess. Most of you chose a), which is I must admit a very good answer. If in this exam I had allowed partial points, I would have definitely given some partial points for a) because it is a good answer really. However, strictly speaking it is not the correct one. Why? Well, open the slides for Lecture 9 and look at slide 81. It looks like this:



So, it is true that the agency costs that come from such problems as excessive risk taking and debt overhang do indeed push leverage down. But other agency problems such as excessive perks, wasteful investments (overinvestment problem), and empire building actually push leverage up. Therefore, generally speaking, the effect of agency cost on leverage is ambiguous.)

Harder questions

7. Consols was a name given to certain government debt issues in the form of perpetual bonds, redeemable at the option of the government. They were issued by the Bank of England and the U.S. Government. The first British consols were issued in the year 1751 and had all been redeemed by 2015.

   Consider a consol with a face value 100 and the promised coupon rate 3% paid annually. Suppose that the relevant discount rate is 4%. Right before its annual payment, let the price of such a consol be given by P_b, while P_a let denote its price right after its annual payment. Determine the numerical values of P_b and P_a. The proposed answers below are reported as (P_a, P_b). Select the correct answer below:

   a) ☐ (13, 16)

   b) ☐ (20, 23)

   c) ☒ (75, 78)

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d) ☐ (69, 72)

(This one is based on Lecture 6. The only thing you were supposed to remember here was that the price of a bond falls by the value of the coupon payment upon it being paid out)

8. Consider a one-year zero-coupon corporate bond with a face value of 100. There is a 10% chance the issuing firm will default on its debt, in which case you can recover only 75% of the promised cash flows. The price of this bond at the issuance date is 94. What are the yield to maturity (YTM), in %, and expected return (ER), in %, on this bond. Proposed answers below are ordered in the following way: (YTM, ER), rounded to 1 decimal place. Choose the correct answer below:

   a) ☒ (6.4%, 3.7%)

   b) ☐ (7.2%, 5.1%)

   c) ☐ (5.6%, 2.9%)

   d) ☐ (7.1%, 8.3%)

(First, let's compute the YTM. This is given by face value over the price minus 1—that is, 100/94-1=6.4% Next is the expected return on bond. First compute the expected band payment, which is (1-0.1)*100 + 0.1*75 = 97.5. To find expected return just divide the expected payment by the price and subtract one—that is, 97.5/94 -1= 3.7%.)

9. Select the correct statement below, if any:

   a) ☒ It is not true that in general a more risky stock (with a higher return volatility) tends to yield a larger expected return

   b) ☐ Diversification helps to eliminate the systematic risk but not the idiosyncratic risk of a security

   c) ☐ Based on historical data, the portfolio of the U.S. small stocks has underperformed compared to the portfolio of S&P 500

   d) ☐ The CAPM states that the market premium on a stock is given by the stock's beta

(This one is based on Lecture 8a. b) is wrong since because it is precisely other way around – super important thing to know by the way super important thing to know by the way--we diversify away the idiosyncratic risk and not the systematic one. c) is wrong you can see it on the slide 9 of the slides for Lecture 8a (the red line is above all others). d) is wrong because the premium is not just beta but beta times the excess return on the market portfolio—again, a very important thing to know. a) is correct and we explicitly discussed it in Lecture 8a – see the slide 54 of the slides for the Lecture 8a.

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The positive relationship between expected returns and volatility only holds for portfolios of stocks and NOT for single stocks. This is precisely because of the fact that we diversify away the idiosyncratic risk and not the systematic one.)

Hard questions

10. The current economic environment is characterized by extremely low interest rates. For example a one-year Treasury bill yields only 0.13 % a year. If you were to invest $42,000 under such interest you would only make $42,000x0.13%=$55 a year. Now, suppose you deposit $42,000 at a bank, which promises to pay exactly this 0.13% annual interest rate (compounding once a year). Furthermore, suppose that such a low interest rate were to persist for ever. How long would you have to wait until you double your investment—that is, before your initial deposit of $42,000 turns into $84,000? Select the answer that is the closest to the correct one:

    a) ☐ approximately 250-260 years

    b) ☐ approximately 420-430 years

    c) ☒ approximately 530-540 years

    d) ☐ approximately over 600 years

(This question is based on Lecture 5. I just really wanted to see if you remembered one important and handy rule that I discussed there. The rule of 70. The idea of this is if you are given an annual interest rate r in % and you want to know how long it will take for your investment that earns this r to double then you just divide 70 by r and that's you approximate answer. Of course it is also possible to do it differently or even to derive this rule from scratch. So 70/0.13 =538.5)

11. JLB Credit, a Germany-based credit company with an office in London, offers you a saving scheme. According to this scheme you receive 4.04% AER with semiannual compounding on your savings deposited at JLB Credit. You decide that you will deposit $1000 every 6 months for the next 12 years *starting from today*—that is, 24 instalments in total. Let **A** denote the cash value of your savings on your JLB Credit account in 15 (not 12) years from now (at the end of year 15, after the last interest has been paid). Find the numerical value of **A**. *Hint: draw the timeline—this will help you much.*

    Let the present value of **A** be denoted by **NPV_A**. Assuming that the relevant *annual* discount rate is 2.00%, what is the numerical value of **NPV_A**? The proposed answers below are reported as **(A, NPV_A)**, with values rounded to the nearest integer. Select the correct answer below:

    a) ☐ (35874, 26655)

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b) ☐ (30422, 22604)

c) ☐ (32861, 24416)

d) ☒ (34945, 25965)

(I wander if any of you noticed a reference here to a great British sitcom. In any case, this was a slightly harder version of one of the problems from the practice exercises. You just need to use the formulas for present and future values of annuities here. Most of you solved this one so I won't present the solution unless some of you would actually request it. But you can create a spreadsheet to see that it works out to the figures in d).)

12. There are thee dates: 0, 1, and 2. A company is considering investing in a project at t=0, which repays at t=2. The project payoff (i.e., the project's cash inflow) depends on the market condition at t=2. If the market goes up in two years then the project generates $3000. If, instead, the market goes down in two years then the project pays back only $800. The probability of the market going up in two years is 30%. The appropriate risk-adjusted rate of return (i.e., cost of capital) is 7%. The initial capital investment required at time t=0 is $1200. Determine the NPV of the project at time t=0—that is, at the initial date—and let us denote this by **NPV_0**.

    Next, suppose that rather than investing at date t=0, the firm could wait for one period (until date t=1) to learn more about what the market will look like at date t=2, and then based on this information it can either proceed with investment or not. If the firm decides to wait then at date t=1 it receives information (i.e., news) about what the market is likely to be like at t=2. This information has either good or bad news about the market at t=2. The probability of receiving good news is 50%. The good news upgrades the probability of the market going up at date t=2 to 60%. The bad news, on the other hand, implies that the market will go down at date t=2 with certainty. The cost of capital and the initial capital investment remain the same if the firm invests at date t=1.

    What is the present value of waiting until date 1? Denote this by **NPV_W**. *Hint: Start by computing the present value of investing at t=1.*

    The proposed answers below are reported as **(NPV_0, NPV_W)** with values rounded to the nearest integer. Select the correct answer below:

    a) ☒ (75, 290)

    b) ☐ (75, 215)

    c) ☐ (75, 127)

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d) ☐ (36, 58)

[This was meant to be a tricky problem and I expected that only about 5% of you will get it right . It was great to see that as many as about 20-25 of you solved it correctly.

So, let's work it out.

First, let's start by finding the NPV of the project if you invest at t=0. This is just equal to the present value of the t=2 cash flows conditional on the market going up times the probability of the market going up plus the present value of the t=2 cash flows conditional on the market going down times the probability of the market going down minus the investment cost—that is, this s given by

0.3*$3000/(1+7%)^2+(1-0.3)*$800/(1+7%)^2-1200 = 75.22,

$3000/(1+7%)^2 is the PV of the cash flows conditional on market going up at t=2. We multiply it by 0.3, which is the probability of the market going up.

$800/(1+7%)^2 is the PV of the cash flows conditional on the market going down at t=2. This happens with probability 1-0.3=0.7.

Ok this was easy. Next, let's find the NPV of the project if you wait until t=1 to make the investment then. So, let's assume we are at t=1. If the news that we receive at t=1 is good then the NPV of the project is

0.6*$3000/(1+7%) +(1-0.6)*$800/(1+7%)^2-1200 = 781.3

Note, we only discount once because we assume that we are at t=1, not t=0. Also note that we use different probabilities. We know that conditional on receiving the good news the probability of the market going up at t=2 is 0.6.

If on the other hand the news is bad, then the NPV is

$800/(1+7%)^2-1200 = -452.3,

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which is negative. Recall from Lecture 3 that we only invest if NPV is positive. Afterall investing in a positive NPV project is equivalent to being paid its NPV upfront. So if NPV is negative this would mean that we losing money. So, no point to invest in a negative NPV project.

Ok, now we need to work out what the NPV of the project is at t=0 if we wait until t=1 to invest. This is just the discounted NPV of the project at t=1 conditional on obtaining the good news times the probability of obtaining this good news. That is,

$$0.5*781.3/(1+7\%) = 365.1$$

You see, you should not forget to multiply by the probability of receiving good news—that is, by 0.5. Recall that if you receive the bad news then the PV is zero since in this case you do NOT invest.

So, what is the value of waiting? Well now it is straightforward to find it it is just the t=0 NPV of the project when we wait until t=1 to invest minus the t=0 NPV of the project when we invest right away at t=0

$$365.1 - 75 = 289.88$$

Hence, the right answer is a).]